

**WHAT IS CLAIMED IS:**

1. A plastic optical fiber preform comprising:  
a substrate having one or more holes; and  
5 one or more materials used for refractive index adjustment provided in the holes,  
the materials having refractive indices different from the substrate,  
wherein distributions of refractive indices of the optical fiber preform are  
selectively adjusted by providing different arrangement and distributions of the number of  
holes formed in the substrate and by varying the refractive indices of the materials used for  
10 the refractive index adjustment.
2. The preform as claimed in claim 1, wherein the materials used for the refractive  
index adjustment are shaped in a rod form.
- 15 3. The preform as claimed in claim 2, wherein each rod has a cross-section shaped  
of a circle or a polygon.
4. The preform as claimed in claim 1, wherein the refractive indices of the  
materials used for the refractive index adjustment gradually decrease in a direction away  
20 from a center of the optical fiber preform.

5. The preform as claimed in claim 1, wherein the refractive indices of the materials used for the refractive index adjustment gradually increase in a direction away from a center of the optical fiber preform.

5        6. The preform as claimed in claim 1, wherein the refractive indices of the materials used for refractive index adjustment gradually decrease and then increase in a direction away from a center of the optical fiber preform.

7. The preform as claimed in claim 1, wherein the refractive indices of the  
10 materials used for refractive index adjustment gradually increase and then decrease in a direction away from a center of the optical fiber preform.

8. The preform as claimed in claim 1, wherein the substrate is a base high molecule member having has a constant refractive index polymerized from one or more  
15 monomers.

9. The preform as claimed in claim 1, wherein the substrate has a cylinder shape.

10. A plastic optical fiber preform comprising:

a substrate having one or more holes; and

one or more materials used for refractive index adjustment and filled in some or all of the holes of the substrate, the materials having refractive indices different from the  
5 substrate,

wherein distributions of the refractive indices of the optical fiber preform are adjusted by manipulating arrangement and distributions of the number of holes formed in the substrate and varying the refractive indices of the materials used for refractive index adjustment.

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11. The preform as claimed in claim 10, wherein the optical fiber preform has cross-sectional planes each including a center axis of the optical fiber preform, such that the distributions of the refractive indices along the center axis are different from each other.

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12. The preform as claimed in claim 10, wherein the materials used for refractive index adjustment have a rod shape.

13. The preform as claimed in claim 10, wherein refractive indices of the materials used for the refractive index adjustment gradually decrease in a direction away from a  
20 center of the optical fiber preform.

14. The preform as claimed in claim 10, wherein the refractive indices of the materials used for the refractive index adjustment gradually increase in a direction away from a center of the optical fiber preform.

5           15. The preform as claimed in claim 10, wherein the refractive indices of the materials used for the refractive index adjustment gradually decrease and then increase in a direction away from a center of the optical fiber perform.

16. The preform as claimed in claim 11, wherein the refractive indices of the  
10 materials used for refractive index adjustment gradually increase and then decrease in a direction away from a center of the optical fiber preform.

17. A method for manufacturing a plastic optical fiber preform, the method comprising the steps of:

15           a) forming a clad substrate having one or more holes, the clad substrate having a constant refractive index;

            b) forming a waveguide of light in the holes by means of materials used for refractive index adjustment, which have refractive indices different from that of the clad substrate; and,

20           c) removing gaps between the clad substrate and the materials used for the refractive index adjustment.

18. The method as claimed in claim 17, further comprising the step of manipulating distributions of the refractive indices of the optical fiber preform by selectively adjusting arrangement and distributions of the number of holes formed in the clad substrate and varying the refractive indices of the materials used for refractive index  
5 adjustment.

19. The method as claimed in claim 17, wherein the clad substrate is a base high molecule member having a constant refractive index polymerized from one or more monomers.  
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20. The method as claimed in claim 17, wherein the materials used for the refractive index adjustment have a rod shape.

21. The method as claimed in claim 17, wherein the gaps are removed through  
15 an over-jacketing (OJ) or a drawing process.